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EVALUATION OF THE MAIN SPATIAL AND ENERGY CHARACTERISTICS OF THE OBSERVABLE UNIVERSE BASED ON THE LAW"PLANCK UNIVERSAL PROPORTIONS"

Hubble Constant and the law of "Planck Universal Proportions" allow us to estimate the basic spatial and energy characteristics of the observable Universe. The gravitational constant can be determined by of the constant of the length, of the mass and time of the Planck, as well as appropriate and proportional to their characteristics of the observable Universe and its any body endowed with weight. The fine structure constant, Planck's constant and the main characteristics of the observable Universe can be algebraic gold fractal.

Keywords: the Hubble constant, Planck's constant, universal proportionsof Planck,spatial andenergy characteristics, the observable Universe, algebraic gold fractal.

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ОЦЕНКА ОСНОВНЫХ ПРОСТРАНСТВЕННО-ЭНЕРГЕТИЧЕСКИХ ХАРАКТЕРИСТИК НАБЛЮДАЕМОЙ ВСЕЛЕННОЙ НА ОСНОВЕ ЗАКОНА "УНИВЕРСАЛЬНЫЕ ПРОПОРЦИИ ПЛАНКА"

Постоянная Хаббла и закон "Универсальные пропорции Планка" позволяют оценить основные пространственно-энергетические характеристики наблюдаемой Вселенной. Гравитационная постоянная может быть определена через константы длины, массы и времени Планка, а также соответствующие и пропорциональные им характеристики наблюдаемой Вселенной и ее любого тела, наделенного массой. Постоянная тонкой структуры, константы Планка и основные характеристики Вселенной могут быть алгебраическим золотым фракталом.

Ключевые слова: постоянная Хаббла, константы Планка, универсальные пропорции Планка, пространственно-энергетические характеристики, наблюдаемая Вселенная, алгебраический золотой фрактал.

Introduction

In [1,2] proposed and experimentally confirmed and substantiated the law of "Planck Universal Proportions". According to this law, in the observable Universe anybody having mass m, creates a gravitational field that curves the surrounding space with a radius of curvature S (actually S -is the length of a gravitational wave) and introducing into this space time delay t_{dm} in the dissemination of signal. Body characteristics m, S, t_{dm} interconnected universal proportions Planck:

$$m = \frac{m_p}{l_p} S; m = \frac{m_p}{t_p} t_{dm}; S = \frac{l_p}{t_p} t_{dm}; S = \frac{l_p}{m_p} m; t_{dm} = \frac{t_p}{l_p} S; t_{dm} = \frac{t_p}{m_p} m, \quad (1)$$

where l_p, m_p, t_p - is the Planck constant, respectively-length, mass and time. Each body characteristics: m, S, t_{dm} separately from other uniquely determines him the energy parameters:

$$E = mc^2 = F_p S = h_e t_{dm}, \quad (2)$$

where $h_e = \frac{E_p}{t_p}$ – is the quantum of Planck energy, where E_p - Planck energy: $E_p = m_p c^2$; F_p - is the Planck power: $F_p = m_p a_p$, where a_p - is Planck accelerating: $a_p = \frac{l_p}{t_p^2}$, and for two bodies with weight m_1 and m_2, length of a gravitational wave S_1 and S_2, the time delay t_{dm1} and t_{dm2} at a distance R from each other, the law of gravity is given by:

$$F = G\frac{m_1 m_2}{R^2} = F_p \frac{S_1 S_2}{R^2} = F_p c^2 \frac{t_{dm1} t_{dm2}}{R^2}. \quad (3)$$

where G – is the gravitational constant, c - is the speed of light in vacuum.

Evaluation of the main spatial and energy characteristics of the observable Universe

According to [3] National Institute of Standards and Technology (NIST) for 2015 constants G, c, l_p, m_p, t_p have the following meanings:

$$\left.\begin{aligned} &G = 6.67408(31)\text{x}10^{-11} m^3 kg^{-1} s^{-2}; c = 299792458 ms^{-1}; l_p = 1.616229(38)\text{x}10^{-35} m; \\ &m_p = 2.176470(51)\text{x}10^{-8} kg; t_p = 5.39116(13)\text{x}10^{-44} s. \end{aligned}\right\} \quad (4)$$

According to Planck's mission [4] Hubble constant H is equal to:

$$H = 67.80 \pm 0.77 (km^1 s^{-1}) / Mpc \text{ or } H = 2.197248345\text{x}10^{-18} s^{-1}. \quad (5)$$

In [1,2,5] it is shown that the Gravity factor g, the radius R_U and mass M_U of the observable Universe can be represented as:

$$g = cH, \quad (6)$$

$$R_U = \frac{c}{H}, \quad (7)$$

$$M_U = \frac{gR_U^2}{G}, \quad (8)$$

or based on (6,7):

$$M_U = \frac{c^3}{HG}. \quad (9)$$

Expressions (6, 7, 9) shows that Gravity factor g, the radius R_U and mass M_U of the observable Universe depends only on the constants c, H and G. Then, in view of their numerical values (4,5) quantitative estimates of Gravity factor g, the radius R_U and mass M_U of the observable Universe are equal to:

$$g = 6.57184822\text{x}10^{-10} m^1 s^{-2}; R_U = 1.364399517\text{x}10^{26} m; M_U = 1.837348566\text{x}10^{53} kg. \quad (10)$$

According to[6] of the International Astronomical Union, a light year is equal to $9460730472580800m$. Then R_U radius of the observable Universe is14.42 billion light-years, which correlates with the experimental data [4]. From (7) it follows that the value of the inverse of the Hubble constant - this is a temporary T_U delay [1] of the observable Universe:

$$T_U = \frac{1}{H}, \quad (11)$$

or taking into (5) evaluation of T_U is:

$$T_U = 4.551469\text{x}10^{17} s. \quad (12)$$

Knowing the estimate of the numerical value of one of the quantities: mass M_U, radius R_U or time delay T_U observable Universe based on formulas (2) can determine an estimate of the numerical value of its total energy E_U:

$$E_U = 1.651326539\text{x}10^{70} J. \quad (13)$$

In [5] it is proved that dark energy does not exist, but it’s the apparent presence is due to rotation of the space of the observable Universe. The kinetic energy of rotation of space of the observable Universe can be a source of dark matter. According to [4] (Planck mission) proportion of dark matter, that is, in fact - the kinetic energy of rotation of space of the observable Universe E_{KR} in the overall balance of the Universe of energy is 26.8% and the proportion of radiant energy can be neglected. Then complete the total energy of the observable Universe is $E_{U\Sigma}$:

$$E_{U\Sigma} = E_U + E_{KR.}. \quad (14)$$

If a quantitative estimate of the kinetic energy of rotation of space of the observable Universe is:

$$E_{KR} = 4.425555\text{x}10^{69} J,$$

then a quantitative estimate of a complete of the total energy of the observable Universe is:

$$E_{U\Sigma} = 2.093882051\text{x}10^{70} J. \quad (15)$$

On the basis of the law of "PlanckUniversal Proportions", the gravitational constant G can be expressed as by the Planck constant: l_p, m_p, t_p and through evaluation of the basic parameters of the observable Universe: R_U, M_U, T_U, that is:

$$G = \frac{l_p^3}{m_p t_p^2} = \frac{R_U^3}{M_U T_U^2} = \frac{4.22191 \cdot 10^{-105}}{2.17647 \cdot 10^{-8} \cdot 2.90646 \cdot 10^{-87}} = \frac{2.53995 \cdot 10^{78}}{1.83735 \cdot 10^{53} \cdot 2.07129 \cdot 10^{35}} = 6.67408 \cdot 10^{-11} m^3 kg^{-1} s^{-2}.$$

This applies to all bodies of the observable Universe have 3characteristics: m, S, t_{dm}.

Algebraic fractals in physical processes

In nature, there are many such processes, which take place at different scale structural levels of matter. In order to study and determine the degree of similarity of the processes necessary to produce the decomposition of each of its various parameters into two components: the scale factor and the intrinsic feature that reflects the essence of the process variable. Among many of these processes have the greatest practical interest fractal processes. Currently most studied fractal geometric phenomena and processes and significantly less - algebraic.

To study the physical phenomena and processes useful algebraic fractals. The most widely used algebraic fractals, which are based on the golden ratio - a harmonic proportion in which the whole refers to the majority of as well as a large part refers to the smaller part.

Representation of functions in the form of algebraic golden fractal

Any given function (hereinafter, for convenience, we shall consider the function of one variable) can be represented as a function of the algebraic golden fractal, which consists of two components: the mantissa function (characteristic function) and the function of the magnitude of the structural level of matter - a function of the scale factor.

In algebraic fractal has its base - is the elementary structural component, on the basis of which synthesized fractal. In algebraic gold fractal a base f_g is equal to:

$$f_g = \frac{\sqrt{5}}{2} - 0.5 = 2\sin(18^\circ) = 2\cos(72^\circ) = 0{,}6180339887498948482045868343656 \tag{16}$$

Mantissa algebraic golden fractal of function $\phi(x)$ is a function $M_g(x)$ that for all values x satisfy the condition:

$$\text{at } \phi(x) \ge 0:\ 1 \le M_g(x) \le \frac{1}{f_g};\ \text{at } \phi(x) \le 0:\ -\frac{1}{f_g} \le M_g(x) \le -1 . \tag{17}$$

For positive constants condition (17) takes the form:

$$1 \le M_g(x) \le \frac{1}{f_g} . \tag{18}$$

Where in: $\frac{1}{f_g} = 1{,}6180339887498948482045868343656$.

The argument y_x of the scale factor function $S_f(y_x)$ is an integer. The algorithm of its creation as follows: for all values $\phi(x)$ that satisfy the condition: $-1 \le \phi(x) \le 1$, the value function $S_f(y_x) \le 0,$ and for the values $\phi(x)$ that satisfy the following conditions: $-\infty \le \phi(x) \le -1,$ or: $1 \le \phi(x) \le \infty,$ the value function $S_f(y_x) \ge 0.$ If : $-1 \le \phi(x) \le 1$, than each function $\phi(x)$ value divided by the value f_g of the number of times until the conditions are met (17), if: $-\infty \le \phi(x) \le -1,$ or $1 \le \phi(x) \le \infty,$ than the function $\phi(x)$ of each value multiplied by f_g the number of times until not the conditions are met (17). In all cases, the exponent y_x of f_g is an argument of function $S_f(y_x)$. On the basis of the algorithm described fractalization function $\phi(x)$ can be written:

$$\phi(x) = (M_g(x))^{S_f(y_x)}. \tag{19}$$

Based on (19) can explore the physical processes that have a different structural scale.

Fractal relations of fine structure constant with Planck's constant and the main the parameters of the observable Universe

On the basis of the proportions of (1) and taking into (4,10,12) can obtain the following equation:

$$A = \frac{R_U}{l_p} = \frac{M_U}{m_p} = \frac{T_U}{t_p} = 8.44187\text{x}10^{60} . \tag{20}$$

It is known [3] that the fine structure constant has the value:

$$\alpha = 7.2973525664(17)\text{x}10^{-3} ,$$

or:

$$\frac{1}{\alpha} = 1.37035999139\text{x}10^{2} . \tag{21}$$

On the basis of formulas (16, 17, 18, 19, 21) can be written:

$$A_\alpha = f_g^5 \left(\frac{1}{\alpha}\right)^{29} = 8.3804482103\text{x}10^{60} . \tag{22}$$

In equation (20) is replaced by the value A of the value A_α, and then find the new number value assessments $R_{U,} H, M_U, T_U$, than:

$$R_U = 1.354472\text{x}10^{26} m; M_U = 1.823979\text{x}10^{53} kg; T_U = 4.51803\text{x}10^{17} s; \\ H = 68.297(km^1 s^{-1}) / Mpc. \tag{23}$$

As can be seen from (23) the value of the Hubble constant is in tolerance $\pm 0.77(km^1 s^{-1}) / Mpc.$

Conclusion

Since the basic spatial and energy characteristics of the observable Universe depends only on the constants c, H, G, then the observable Universe is limited. Limitations of the observable Universe is one of the necessary conditions for the constancy of the fundamental physical constants. The fine structure constant, Planck's constant and the main characteristics of the observable universe can be at different structural levels of matter algebraic gold fractal.

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